The South African Journal
of
Medical Laboratory Technology

ORGAN OF THE SOCIETY OF MEDICAL LABORATORY
TECHNOLOGISTS OF SOUTH AFRICA

Vol. 7 No. 4 A QUARTERLY December, 1961

Die Suid-Afrikaanse Tydskrif
vir
Mediese Laboratorium Tegnologie

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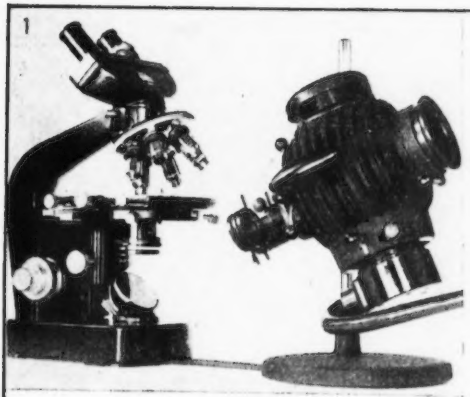

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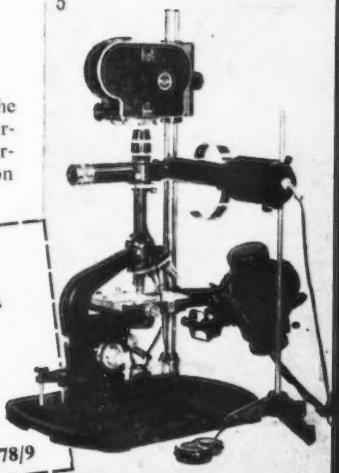

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Current Affairs *The Editor*

IN MARCH, 1960, whilst discussing Supplementary Health Services in this column, I expressed the hope that the goodwill which existed between the Society, the registering authority (the South African Medical and Dental Council) and employers of technologists would continue as control of education and training is established on a national basis.

The plea appeared before blind eyes and the question of a separate register for Blood Transfusion Technologists is being argued, rather acrimoniously at the moment. Should a separate register be opened the expressed threat of virus and microbiological departments is for a separate register in each of these categories. How separate can you get? Who is going to man the clinical laboratories if this trend continues? The Society's spokesmen have met stern opposition to their request that all categories remain on a common register and this opposition appears to be based on the premise that medical technolgoists are in no position to know what is best for their own good! The profession of medical laboratory technology is not a profession at all but is wholly dependent upon the goodwill (sic!) of the medical profession whose slave it is. The extract from the *Lancet* of June 1959, which is reprinted elsewhere in this issue, is germane to this argument; but in spite of it the profession of medical technology continues to grow and to organise itself on a world-wide basis, as is shown by the report on the survey conducted in 1958/59.

The increasingly high standards of medical laboratory technology in this country have come about largely through the efforts of medical technologists, with the help of far-sighted pathologists and educators, but often in the face of considerable opposition from those, pathologists and others, who view with considerable alarm the production of what they are pleased to term "little professors".

Quoting once again from a letter to the *Times* by the Chairman, Board of Directors of Physiotherapy, Province of Ontario, Canada, published on December 7th, 1959: "During the past 20 years legislation governing many of the auxiliary professions has been introduced in most of the provinces . . . in our experience, if a question of standard arises, it has been the practising physiotherapists who have argued for higher and therefore safer standards, not, with some notable exceptions, the medical

profession." We are faced with the conclusion that the same holds good for medical technology.

The advice of medical technologists experienced in the practice of their profession and in the teaching and examination of medical technologists should not be lightly discarded on the grounds that they are not competent to tender such advice—they are and they seek to maintain standards which have already been set. This is not to say that medical technologists wish to dictate the terms upon which others may be trained and employed but merely that they can see the harm which will be done, and the inevitable lowering of standards which will accompany the introduction of a myriad of separate registers.

Once again may I plead for a level-headed approach to this problem and for a willingness to see the other point of view. No possible good can come of an open breach between medical technolgoists and members of the medical profession.

Huidige Gebeure — *Die Redakteur*

IN ONS MAART UITGAWE het ons bespreking in hierdie kolomme oor die Supplementêre Gesondheidsdienste gegaan. Ons het toe die hoop uitgespreek dat die welwillendheid wat daar tussen die Vereniging en die owerheid met registrasie belas (d.w.s. Die Suid-Afrikaanse Mediese en Tandheelkundige Raad) asook die werkgewers van ons tegnoloë bestaan, sal bly voortbestaan om beheer uit te oefen terwyl die onderwys en opleiding van tegnoloë op 'n nasionale grondslag ingestel word.

Ons pleidooi het egter op dowe ore geval en nou word die kwessie om 'n aparte register vir tegnoloë in die Bloedoortappingsdiens met 'n sekere mate van geniepsigheid, oor geredekawel. Indien 'n aparte register ingevoer word, dan bestaan daar ook nog die Virologie en Mikrobiologie afdelings se verklaarde dreigement an afsonderlike registers vir hulself. Hoever kan hierdie afsondering gaan? En wie gaan die kliniese laboratoria dien as hierdie neiging sou uitbrei? Die Vereniging se woordvoerders het sterk teenkanting ondervind met hulle versoek om 'n gemene register vir al die afdelings van Mediese Tegnologie. Die opponente van 'n gemene register is skynbaar die mening toegedaan dat mediese tegnoloë nie by vermoë is om te weet wat vir hulle die beste is nie. Die

professie van Mediese Laboratorium Tegnologie is blykbaar nie 'n professie nie, maar is geheel en al afhanklik van die goedgesindheid (Sic) van die Mediese professie wie se slaaf hulle is. Die uittreksel uit die *Lancet* (Junie, 1959) wat elders in hierdie uitgawe gepubliseer word, het betrekking op hierdie argument. Nieteenstaande hiervan groei en organiseer die Mediese Tegnologie vanself op 'n wêreldwye wyse soos gesien kan word in 'n rapport van 'n ondersoek gedurende 1958/59.

Die tonemende hoë standaarde wat in hierdie land gestel word aan Mediese Laboratorium tegnoloë, is grootliks teweeggebring as gevolg van die eiwer van mediese tegnoloë met die hulp van vêrsiende patoloë en opvoedkundiges, dikwels nieteenstaande erge teenkanting van patoloë en andere wat met ontsteltenis die ontstaan van „klein professore", soos hulle hulle noem, bejeën.

Om weereens aan te haal uit 'n brief in die *Times* deur die Voorsitter van die Direksie van Fisioterapie, Ontario, Kanada, en soos gepubliseer op 7 Desember 1959: „Gedurende die laaste 20 jaar is wetgewing ingedien vir die beheer van die hulp-professies in die meeste van die provinsies ... in ons ondervinding, wanneer 'n kwessie van standaarde opduik, was dit die praktiserende fisioterapeute wat om hoër en gevolglike veiliger standaarde gevra het en nie, met sommige vername uitsonderings, die mediese professie nie". Ons kom hier te staan voor 'n afleiding dat dieselfde van tepassing is op mediese tegnologie.

Die advies van mediese tegnoloë met ondervinding in die praktyk van hulle berope, in die opleiding en afneem van eksamens in die mediese tegnologie, moet nie ligtelik versmaai word op grond dat hulle nie bevoegd sou wees om sulke advies te verleen nie. Hulle poog altyd om standaarde wat reeds bestaan te behou. Dit wil natuurlik nie sê dat mediese tegnoloë die bepalings van ander se opleiding en werkgewing wil dikteer nie, maar slegs dat hulle instaat is om die skade wat berokken kan word en die verlaging van standaarde wat sal volg, kan insien wanneer groot aantalle aparte registers ingestel word.

Mag ons weer pleit vir 'n verstandige benadering van hierdie probleem en vir 'n bereidwilligheid om mekaar se gesigspunte duidelik te kan insien. Daar kan geen goeie gevolge ontstaan uit 'n openlike skeuring tussen mediese tegnoloë en die lede van die mediese professie nie.

SOME OBSERVATIONS ON LATE RADIATION CHANGES AS SEEN IN VAGINAL AND CERVICAL SMEARS

G. W. WIKELEY

Exfoliative Cytology Laboratory,
Addington Hospital, Durban

THE IMMEDIATE EFFECT of irradiation therapy on both benign and malignant cells have been well described (Graham 1947) and it is rather surprising to find that changes occurring later than twelve months after treatment and which can only be ascribed to irradiation, have been largely ignored.

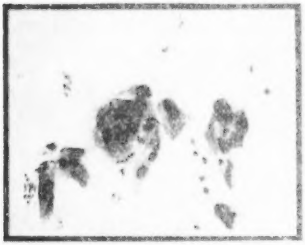
One is led to believe that the effects of irradiation therapy are comparatively short-lived and in the majority of instances this appears to be so. However, individual patients will continue to show aberrant cells for a considerable time, sometimes for many years.

Zimmer (1959) reported upon a series of 19 patients, and the instances reported here have been selected from amongst a group of 130 patients who attend the "follow up" clinic of this hospital at regular intervals. They have been chosen as representative of the type of change referred to as late radiation change and they are all clinically free of malignant disease.*

Smears from patients after irradiation therapy show a pronounced acidophilia and this is also noted in the later smears. Superficial cells show the most marked irregularities but the change is not confined to them. Superficial cells are found as isolated cells, in sheets and in irregular clumps or clusters. Keratinisation is seen in all its forms from nucleated cells to anucleated plaques. Nuclei show considerable variation, they may be small and pyknotic, large and faded or elongated and hyperchromatic. When hyperchromatic there is complete loss of chromatin detail and pattern. Vacuolation is often present and may be very pronounced (fig. 4). Of particular interest is the apprearance of single, double and triple interwoven shreds of intensely basophilic staining material (figs. 2, 6, 8) which is probably mucous in origin. This is frequently found and examination of some hundreds of smears from non-irradiated patients attending the routine gynaecological clinics failed to show similar arrangements although threads or tails of nuclear material may be seen in smears from patients in advanced menopause.

The shreds appear as a network or a loosely intertwined bundle of fibres enmeshed in which can be seen individual cells showing any of the variations mentioned above (fig. 6). Occasionally free nuclei are seen as amorphous blobs showing no nuclear detail whatsoever.

*Routine treatment consisted of two radium insertions followed by hysterectomy or by deep X-ray therapy.



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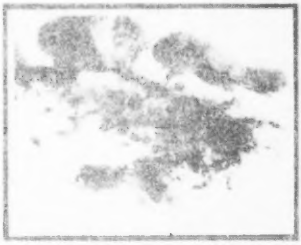
Figs. 1, 2 & 3.
Treatment completed October 1959.
Smears taken 14, 17 and 19 months later.

Fig. 4.
Smear taken 24 months after treatment.

Fig. 5.
Smear taken 18 months after treatment.



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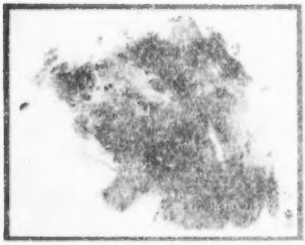

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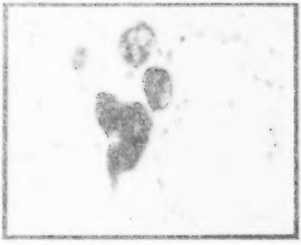

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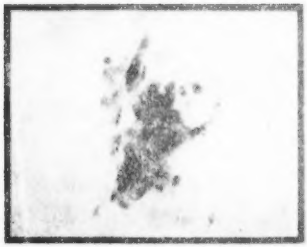

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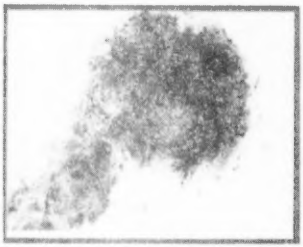
Fig. 6.
Smear taken 14 months after treatment.

Fig. 7.
Smear taken 20 months after treatment.

Fig. 8.
Smear taken 22 months after treatment.

Fig. 9.
Smear taken 41 months after treatment.

Fig. 10.
Smear taken 21 months after treatment.



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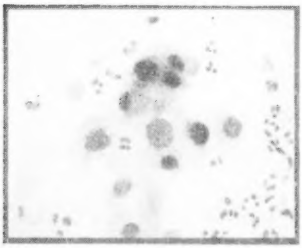

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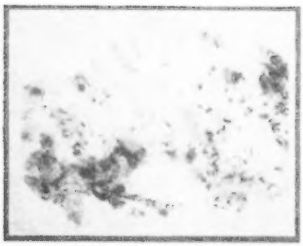

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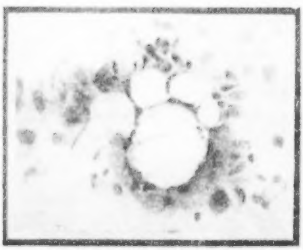

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Generally the smears show a paucity of leucocytes, basal cells are small and often few in number. The picture is of a clean smear.

The significance of the later radiation changes is not immediately apparent but is is evident that, occurring as they do in some 10% of our irradiated patients, they should be taken into account when assessing radiation response.

ACKNOWLEDGEMENTS

I am grateful to the Chief Pathologist, Natal Provincial Pathology Services for permission to publish these observations, to Mr. C. R. Stuart, Pathology Dept., Medical School, University of Natal, for the photomicrographs and to Dr. A. Brown of the Radiotherapy Dept., Addington Hospital for his interest and help.

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Graham, R. M., *Surg. Gynec. and Obst.* **84**, 153-173, (1947.)
Zimmer, T. S., *Cancer* **12**, 193-196, (1959.)

The following, reprinted with acknowledgement, from The Lancet *of 20th June, 1959, embodies arguments which are being used to prevent medical technologists from 'interfering' in their own training to-day in South Africa.*

DIALOGUES OF TO-DAY

PROFESSIONS SUPPLEMENTARY

SOCRATES: I hope that your rheumatism is better, Apollodorus.

APOLLODORUS: Yes, thank you, Socrates, I have quite recovered, thanks to Eryximachus.

SOCRATES: What treatment did he give you?

APOLLODORUS: He didn't give me any, himself; but he said, 'Go to Chloe, and get her to give you some physiotherapy'. So I did, and she did, with the result that you have heard. But here is Eryximachus. I was just telling Socrates, Eryximachus, how well Chloe has dealt with my rheumatism.

ERYXIMACHUS: Yes, she knows her job; but these girls are getting above themselves nowadays. In fact all the medical auxiliaries are. They want to speak of their work as their profession, and to control their training themselves, instead of leaving it to be controlled by the doctors, which is the only logical state of affairs.

SOCRATES: I am always glad to hear that logic is being applied to any practical matter, Eryximachus, so tell me why it is logical that the training of the medical auxiliaries should be controlled by doctors.

ERYXIMACHUS: Surely it is obvious, Socrates. What they do is a part of medicine. They use in diagnosis or treatment methods which have been devised by doctors, under the supervision of doctors, and to aid the

purpose of doctors, which is to relieve, and if possible cure, the patient. It follows, surely, that the doctor must know better than the auxiliary how the things the auxiliary does should be done, and what training he or she needs in order to do them.

SOCRATES: Well, explain to me, Eryximachus, what a profession is, and why the term does not apply to the work of the auxiliaries.

ERYXIMACHUS: I find this a little difficult, Socrates, for the meaning of a profession seems to be getting somewhat blurred. Nevertheless I think it still has value. Surely a profession implies a number of things. Perhaps the essentials are certain aims and ideals beyond merely making a living, including the service of the public, ethical standards, and a sense of pride in the calling itself, which unites those who belong to it.

SOCRATES: And is learning one of the attributes of a profession?

ERYXIMACHUS: Not essentially, I think; for although we speak of the learned professions there are others, for example, the armed services, which could hardly be called that.

SOCRATES: And is it necessary that a profession should govern itself?

ERYXIMACHUS: Certainly, for only in that way can it be sure of maintaining its ideals.

SOCRATES: Medicine, of course, is a profession.

ERYXMICHUS: Of course!

SOCRATES: And you said just now that the work of the medical auxiliaries is a part of medicine. Are they not then part of the medical profession?

ERYXIMACHUS: I was speaking of medicine in a wider sense, Socrates. A profession requires a certain common background of ideas and training which doctors possess, but which medical auxiliaries do not. They may be part of medicine, but they cannot be part of the medical profession any more than a private soldier can be regarded as a professional man.

SOCRATES: Do you think that, as part of medicine, they ought to have the aims and ideals of the profession which you have mentioned—namely, a sense of service going beyond financial reward, ethical standards, and pride in their work?

ERYXIMACHUS: Certainly they should.

SOCRATES: Then would it not seem essential, if they are not to be part of the medical profession, that they should constitute their own professions having, as you rightly say, the same purpose as doctors?

ERYXIMACHUS: I don't mind their calling themselves the professions supplementary to medicine, if that gives them any satisfaction, but I still maintain that they should be controlled by doctors.

SOCRATES: But are the affairs of nurses controlled by doctors?

ERYXIMACHUS: That's different. Medical auxiliaries only do what doctors would otherwise have to do themselves, whereas nurses have many techniques of their own as well as what they do for doctors. In any case I'm not sure it wouldn't be better if doctors had more control over the training of nurses. As it is, in my opinion they are taught far too much medicine which they don't really need to know.

SOCRATES: You are indeed hard to please, Eryximachus; for if I understand you aright, you think the training of the medical auxiliaries should be controlled by doctors because they are a part of medicine, and that of the nurses because they are not.

APOLLODORUS: You are an old humbug, Eryximachus, for you know perfectly well that when you sent me to Chloe you left the treatment to her. You wouldn't know how to turn on the apparatus, yourself, let alone what dose of the rays to give.

ERYXIMACHUS: That is beside the point, Apollodorus, which is that there are some doctors who are experts in all these matters.

ENTHUSIASTICUS: In my view, Socrates, Eryximachus is behind the times. Once again we are up against the speed with which medicine is moving. Doctors, let's face it, can no longer do everything in medicine. They've got to delegate much of their work to non-medical experts in order to get on with their own job, which is more and more to be the captain of a team. The question is whether the team will work better if it has some responsibility for what it does.

SOCRATES: Well, Eryximachus, it seems to me that we have agreed that the work of the medical auxiliaries is part of medicine, but that they are not part of the medical profession. You want them to maintain professional standards, and you say that a profession should govern itself. Does it not follow that the professions supplementary to medicine should govern themselves?

ERYXIMACHUS: You can always argue better than I can Socrates, but all the same it wouldn't work!

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THE PROFESSIONAL SITUATION OF THE MEDICAL LABORATORY TECHNOLOGIST

Report of the Study Groups of the I.A.M.L.T.
(International Association of Medical Laboratory Technologists)

I. Introduction and Historical Background.

II. Questionnaires.

III. The situation in European Countries.
1. Belgium
2. Denmark
3. Finland
4. France
5. Germany
6. Great Britain
7. Netherlands
8. Norway
9. Sweden
10. Switzerland
11. Other countries (Austria, Greece, Italy, Poland, Portugal, Spain and Yugoslavia).

IV. The situation in Non-European Countries.
1. Africa
(*a*) Central Africa
(*b*) South Africa
2. Australia
3. Canada
4. New Zealand
5. U.S.A.
6. West Indies
7. Other countries (Japan, Israel, Lebanon, Mexico).

V. Summary and Conclusions.

I. INTRODUCTION AND HISTORICAL BACKGROUND

The conception of the idea of forming an international group of medical laboratory technologists dates back to 1954, when the Swiss Association of Medical Laboratory Technologists organised the first international congress in the field. The response was so rewarding that an international committee with an office in Switzerland was elected there and then. Every year since then a delegates' meeting has been held in different countries and the association was definitely established with legal statutes in 1959. At the Amsterdam meeting in 1957 study groups were organised to investigate the practice of the profession throughout the world.

In the first instance it is necessary to determine exactly what is meant by "Medical Laboratory Technologist". It is also important to explain why this designation was chosen for the description of the profession all over the world. Medical laboratory technologist is the American title for the technical staff of the medical laboratory who have followed a thorough practical and theoretical training and finished the studies with a diploma which entitles them to the designation of Registered Medical Laboratory Technologists.

This term has been adopted to avoid the confusion that may arise out of the different titles in use in European countries, which apply to qualified and unqualified medical laboratory staff.
It may be useful to give some of the names used in the different countries:

Belgium ..	Assistante de laboratoire.
Denmark ..	Laboratorieassistenter—Hospitalslaboranter.
Finland	Laboratoriosairaanhoitajien (laboratory nurse), Sairaalalaborantit (Hospital technician).
France	Technicienne d'Analyses Biologiques, Laborantine Médicale.
Germany ..	Medizinisch-technische Assistentin.
Great Britain	Medical Laboratory Technician.
Netherlands	Medisch Analyste.
Norway	Laboratorie-Sykepleie (laboratory nurse)
Sweden ..	Laboratorie-Sjuusköterke (laboratory nurse), Laboratris, Preparatris (technician for general laboratory or for histology-bacteriology).
Switzerland ..	Medizinische Laborantin, Laborantine médicale.

The title 'Medical Laboratory Technologist' (MLT) will therefore be used in this report. It is once more emphasized that the societies which are members of the I.A.M.L.T. represent exclusively groups of qualified MLT's holding diplomas. These societies endeavour to obtain for thier members improved conditions and professional status.

II. QUESTIONNAIRES

Four groups were formed to study the following questions:

(*a*) Requirements for registration, including the methods of training.

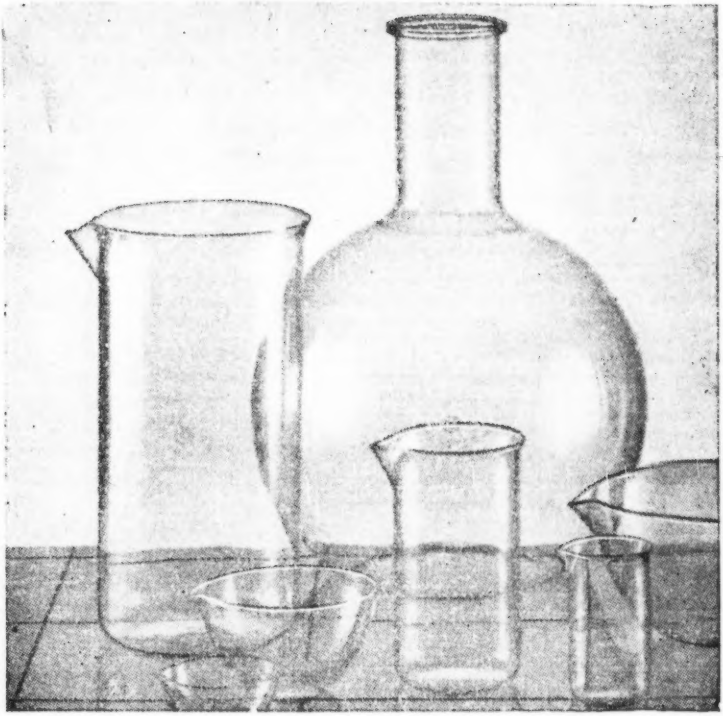
(*b*) Conditions for employment in other countries and arrangements for the interchange of personnel.

(*c*) Scholarships, Fellowships and postgraduate studies.

(*d*) Co-operation with related bodies.

Detailed questionnaires were sent out to all available addresses.

In the following report emphasis is laid on the results of study group (*a*) as the most important. A summary has been made of each country and it seemed preferable to present the European and non-European countries separately.



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III. THE SITUATION IN EUROPEAN COUNTRIES

1. Belgium

In Belgium, schools of MLT exist generally attached to universities, a technical school for chemistry or brewing, or a nursing school in a university hospital. The situation seems not yet quite clear, the standard of the different schools being variable.

Detailed information was provided by the Saint-Lieven School in Gent.

Basic educational level before entry as a student is matriculation (humanistic science, mathematics) or admission examination after preparatory course of one year at the same level.

Professional training: 2½ years at schools, 5 months practical work as a probationer in the speciality chosen by the candidate. The instruction comprises all branches of general laboratory work, including bacteriology.

The diplomas of laboratory assistants are controlled by the Ministry of Education and are issued for different specialities as: clinical chemistry, industrial chemistry, food chemistry.

Examinations are held after every year, the examiners being professors of the schools with medical doctors and laboratory chiefs as experts and a government inspector.

The profession can be practised with or without a diploma.

The salaries are variable.

There is no official professional association, apart from the organisations of past students of the various schools.

2. Denmark

The instruction in MLT takes place partly in recognised laboratories (practice) and partly in technical schools (theory).

Educational standard: Age of admission, 17 years. Diploma of secondary studies. Professional training: The first 3 months are practical laboratory work (one professor accepting responsibility for the students and controlling their work), then 3 months at a technical school for theory. The following 2½ years are spent with practical work in an approved laboratory except for 4 months spent again in a technical school. Total duration of studies 3 years. In certain cases secretarial work is included in these studies. There is a common study programme for the whole of Denmark, but there is no common diploma.

Examinations are theoretical and practical. Examiners are professors and directors of laboratories, but the technical school issues the diploma. The MLT have an all-round training except for bacteriology; no general instruction is included. There exists since 1959 a post-graduate training school for instructors and senior staff.

Official recognition is expected in the near future.

There are two professional associations in Denmark.

3. Finland

Laboratory work in Finland is done by two categories of staff, either by laboratory nurses or technicians. The first are trained for 2½ years as nurses in a nursing school of a hospital and then for 9 months in the different branches of laboratory work. The *educational standard* is 5-6 years secondary schooling and the entrance age is 19 years. For the training of the second type of technician two schools exist, one in Helsinki, the other in Turku. The duration is of one year. The examinations are written. The training is all-round but seems to be insufficient. The situation is still rather confused.

Both nurses and the technicians certificates are issued by the government.

Each category has its own professional association.

4. France

In France there were private schools long before the second world war but at present there are private schools, private schools recognised by the government, and national professional schools with special sections for the instruction of MLTs.

Educational standard: Matriculation or admission examination. Age of admission 18 years. The two first mentioned schools deliver diplomas, some of which are recognised by the government. The third delivers a diploma of the national professional school, after two years of studies for medical laboratory technician, issued by the Ministry of Education. Another diploma is the diploma for technicians of Biological Analysis which was introduced some years ago. This examination is a national one and everybody with professional training, either acquired in a school or in an apprenticeship combined with evening classes, can present himself for this examination. A good general education is demanded. The programme is national for this examination and includes branches of general instruction such as French, mathematics and physics. The examiners are doctors, directors of laboratories, representatives of the profession and of the Ministries of Education and Health. These two Ministries issue the diploma.

In the official schools the national programme is strictly followed; the private schools are free to adopt it or not. Technicians have an all-round training but special attention is given to biological chemistry and bacteriology.

The profession can also be practised without a diploma.

The salaries of laboratory technicians with a diploma are adapted to the ones for social assistants and specialised nurses. The only professional association is the regional association of MLTs of the departments of the Low Rhine, High Rhine and Mosel; there is no national society yet.

5. Germany

The training of the MLT in Germany is regulated by law. At present it is the only country in which the profession is officially recognised and where the training and employment is under strict legal regulations.

Minimum educational standard is 10 years of schooling and an age of 18 years. The professional training is done in state schools attached to university hospitals or institutes. The study programmes are the same and include all the branches of medical laboratory work, as well as radiography. The diploma is official and is granted by the Ministry of Public Health. The professional practice is regulated by law. Unfortunately the most recent legislation has caused some confusion by permitting non-qualified technicians to work under constant supervision of a doctor, except in bacteriology.

This new regulation has caused numerous strong protests.

In some places refresher courses for postgraduate technologists are arranged by societies and schools in Berlin, aided by the Ministry of Public Health.

The salary ranges are according to official scales.

Different professional associations exist, some strictly professional while others are associated with trade unions.

6. Great Britain

The position in Great Britain is different from most other European countries. All medical laboratory technologists in the National Health Service are required to have passed the qualifying examination of the Institute of Medical Laboratory Technology, which is a non-governmental organisation; it is also a professional society in addition to being a tutorial and qualifying body. The Institute is the only organisation which caters for MLTs in Great Britain. Of its membership of about 7,000 over 700 hold appointments in other parts of the British Empire and elsewhere.

The training in Great Britain is a combination of apprenticeship instruction in the laboratory and part-time tutorial classes. The intermediate examination is taken after 3 years' training and the completion of the tutorial course; a further 2 years' training is necessary for entry to the Final examination for Associateship. Diplomas for Associateship and Fellowship are issued by the Institute.

The Institute's examinations are controlled by the respective examining bodies for the intermediate and final examinations, the former consisting of Fellows of the Institute and the latter of an equal number of Pathologists and Fellows. Both examinations have practical, oral and written sections but while the intermediate is of a general nature the final examination is restricted to the one subject of the candidate's choice. Fellowship may be obtained as a post-graduate qualification in various

ways, including the submission of a thesis on original work undertaken by the author.

Before entry for the Institute's examinations registration as a student is necessary, for which applicants must be at least 16 years of age and have passed the General Certificate of Education in at least four appropriate subjects.

7. The Netherlands

In Holland the training of the MLT is done in special schools.

Educational standard: Matriculation or entrance examination after one preparatory year; no age limit.

Training: After 5 months' schooling preliminary examination; after another 6 months examination for "Student Technologist". One year as a probationer in a recognised laboratory, after which the final examination is taken in one of the following specialities: bacteriology, clinical chemistry, general clinical laboratory work.

The courses are given in private schools, but the training programme is the same for the whole country.

The diploma is issued by the Royal Dutch Association of Chemists.

The examiners are members of this association and government inspectors. Recently several state schools have been opened but the final examinations have not yet taken place. The exercise of the profession is free. The profession is not yet officially recognised, but legal regulations are in preparation.

8. Norway

In Norway as in most of the Scandinavian countries, the training of the MLT is attached to the nurses' training. In some hospitals there are special training courses for technologists only. The duration of the training varies from 1 - 3 years. Age of entrance 20 years. No national study programme exists. The technologists are trained as specialists in the various fields of clinical chemistry, bacteriology, histology, etc.

The training seems to be insufficient. The profession is not officially recognised. There exists a society of MLT as a subdivision of the nurses' association. The professional group expressed the wish to be aided by the I.A.M.L.T. to organise the society on a sounder basis and to establish a better training scheme.

9. Sweden

In Sweden three methods of training for MLT exist. The oldest way is to have a nurses' training with specialising in the end in clinical laboratory work. Entrance is at 20 years of age after a good secondary schooling or matriculation. The second method is to train in schools or as an apprentice for 3 years in different fields of laboratory work, including bacteriology (which the laboratory nurses' training does not include).

The third scheme is to train as a specialist in histology. The studies are concluded by examinations but the exercise of the profession is unrestricted; the diplomas are not officially recognised, except those as nurses.

Each group has its professional association. A new training scheme for the whole country is in preparation and if accepted will be a starting point for the re-organisation of the profession.

10. Switzerland

In Switzerland the entrance age for the professional training is 18 years. The educational standard 10-12 years of schooling. The training takes place either for two years in special schools, in which the only subject taught are the branches of laboratory work in theory and practice, or for three years in apprenticeship at a large hospital, which provides the necessary theoretical courses. The training is concluded by examinations, the examiners being medical doctors and senior MLTs. The diplomas are issued either by the schools, the government or the professional society. The training covers all branches of laboratory knowledge. The profession is not yet offiically recognised but is controlled partly by cantonal regulations. There is one national professional society and the practice of the profession is unrestricted.

11. Other Countries

The information received from **Austria** states that there are several schools for the training of medical laboratory technologists. The training scheme is comparable with the German pattern. A law regulating and protecting the profession is in preparation. There exists a society catering for all the medical auxiliary professions, with a special section for MLTs.

In **Greece** no schools for MLTs exist, diplomas are not issued and only a few research and university laboratories have a moderate number of technicians.

In **Italy** some groups of hospitals train MLTs and issue a type of diploma, but the profession as such is not yet established and there is no association.

In **Poland** all MLTs belong to a trade union of public health workers. No details of training, etc. were obtained.

In **Portugal** a society for MLTs does not exist, therefore detailed information was not available. Some MLTs are members of the Portuguese Society of Biochemistry.

In **Spain** the profession is also not yet established and there is no professional society. The training arrangements are very insufficient. The Council of Scientific Research organises a course for specialists in research work in Madrid. No detailed informaion was received.

The information received from *Yugoslavia* states that the training schemes exist only in three of the twenty medical schools with about 60-70 laureates per annum. All medical and chemical laboratory tech-

nicians are organised in trade unions, but not in professional societies. Most of the institutes or laboratories provide a training for unqualified personnel.

IV. THE SITUATION IN NON-EUROPEAN COUNTRIES

1. Africa

(*a*) *Central Africa.* The training of the MLT is uniform throughout the whole country. It consists of an apprenticeship of three years in laboratories, including all branches of laboratory work. After that time the intermediate examination has to be passed; then a period of two years allows the candidate to go in for specialisation in one of the fields, such as bacteriology, haematology, parasitology, biochemistry or histopathology. The intermediate examination cannot be passed before the age of 20. The educational standard before entering professional training is 4 years of secondary schooling. The diploma is issued by the 'Medical Council', the examiners being medical doctors and qualified technologists.

The profession is not officially recognised. The 'Medical Council' issues regulations for the training and examinations. The diploma is required for appointments in Public Health laboratories, but not for private ones. A scale of salaries is in operation in public laboratories.

One professional society caters for all technologists of Central Africa. The Association tends to replace the 'Medical Council' and to take over the registration. The whole scheme is about the same as the British Institute of Medical Laboratory Technology, as far as local conditions allow it. The association endeavours to obtain uniform conditions for technical staff in government laboratories, as well as the non-governmental ones.

The society is interested in having as much information as possible through the I.A.M.L.T. of conditions in other countries.

(*b*) *South Africa.* The training is not yet uniform throughout the country. No age limit exists for entering the training, which last 5 years as apprentice in an approved laboratory. After the first two years an 'intermediate' examination has to be passed in general subjects, such as chemistry, physics, anatomy and physiology. The professional subjects are examined later and two subjects can be taken each year. The examinations are organised by technical colleges together with the South African Medical and Dental Council. There are some laws regulating the profession, but the diploma is not compulsory for the practice of the profession.

One single society of MLTs exists for the whole country. Negotiations have been held to obtain a uniform plan of training for the whole country, leading to a diploma recognised by the State. State legislation in this respect is impending. There is no official scale of salaries. The professional society feels rather isolated and hopes to profit from joining the I.A.M.L.T.

2. Australia

The training, examinations and registration of MLTs in Australia follows the pattern of Great Britain, that is entrance age 17-18 years, good educational standard, 5 years' apprenticeship in approved laboratories with evening classes in theoretical subjects. The training is almost uniform in the different States of Australia except in New South Wales, where the diploma is issued by the board of hospitals, rather than by the Australian Institute of Medical Laboratory Technology. The profession is not officially recognised and it is not regulated by legislation. The Australian Institute of Medical Laboratory Technology is the professional society all over Australia. It supervises the training in addition to organising the examinations and refresher courses.

3. Canada

The professional training within Canada can be obtained in three ways:

(*a*) in a school combined with practical work as a probationer;

(*b*) by apprenticeship in a laboratory;

(*c*) by university training and practical work as a probationer.

The teaching programmes are different in the various provinces of Canada. The educational standard is advanced studies, including chemistry, physics, biology, mathematics, to a minimum age of 18 years.

The training lasts from 12-24 months and finishes with examinations in the different fields, the examiners being doctors and technicians.

The professional Society is the 'Canadian Society of Laboratory Technologists' which is the registering body. The diploma is the same for all provinces. The instruction is an all-round training. The formation of specialists is generally a postgraduate study.

The profession is organised nationally, but not yet officially recognised.

Special laws are in preparation.

4. New Zealand

The training system is uniform in the whole country, 5 years' apprenticeship, with an intermediate examination after the first 3 years. The final examinations are held by doctors and members of the Society of Bacteriologists. The diploma is issued by the Ministry of Health. Technologists with diplomas are paid the official salary grades, but unqualified persons can work as technologists as well at a lower salary. The profession is regulated by laws. Most MLTs are members of the New Zealand Association of Bacteriologists. This Association wishes the I.A.M.L.T. to recognise its diplomas.

5. United States of America

The professional training in the U.S.A. is undertaken in schools which are generally attached to universities. The duration is 4-5 years, including college, and 12 months' practical work as a probationer in a hospital laboratory approved by the American Medical Association. The basic studies are more or less the same all over the country, but the study programme varies in the different educational centres. The final examinations have to be approved by the Registry of Medical Technologists of the American Society of Clinical Pathologists. The registry examination is an all-round laboratory examination, but university degrees can be acquired for specialities. The exercise of the profession is free.

The professional association, the American Society of Medical Technologists is in close co-operation with the Registry, with the Society of Clinical Pathologists and the different schools. The examining Council of the Registry is composed of 6 medical doctors and 3 representatives of the American Society of Medical Technologists.

There are no federal laws which regulate the profession and only a few States (California, Florida, Alabama) have special laws for the practice of the profession. There are no official scales of salaries but there are unofficial agreements. A Federal Commission has recently elaborated a status for the MLTs (August 1958). The professional society has branches in all the States of the U.S.A.

6. West Indies

The profession is still very young in the different territories of the West Indies. The professional society supervises the training, which follows the system of apprenticeship, organises the examinations and issues the diplomas. After three years of training the intermediate examination as an all-round MLT has to be passed; this cannot be done before the age of 20 years. Two more diplomas in specialist subjects can be obtained (diplomate or fellow), each after one more year's training in the various specialities. The profession is not yet officially recognised and there are no laws which regulate it neither have offiical salary scales been obtained. Sections of the professional group are in the different islands of Jamaica, Trinidad, British Guiana, Honduras, St. Kitts, Grenada and Nassau. The society hopes to get the co-operation of the I.A.M.L.T. in its endeavour to obtain official recognition of the profession as well as laws to regulate it.

7. Other Countries

In *Japan* the first qualifying examinations for MLTs were held in 1954 by the Japanese Society of Clinical Pathology. Since then a professional association has been formed, which now takes an active part in the training of the MLTs and in the organisation and establishment of the profession. Recently a State examination was introduced. The

Japanese Society is very eager to get in touch with professional societies all over the world and hopes to get help in their aims through I.A.M.L.T.

In *Israel* the basic education of the laboratory technicians is supervised by a special department for professional education in the Ministry of Health in Jerusalem. There are several schools for technicians (in Jerusalem, Tel-Aviv and in Ramat Gan). A professional organisation of 'laboratory workers' exists, but no more detailed information was obtained.

In *Lebanon* a society of MLTs does not exist. In the School of Public Health at the American University in Beirut a basic course in laboratory technique is given with a grant of a certificate of MLT.

From *Mexico* only limited information was obtained, from which it is evident that no professional society exists. In some centres technicians are trained, but as in all Latin-American countries, the profession is only beginning to develop.

V. SUMMARY AND CONCLUSIONS

Although not all questionnaires sent out were returned with the necessary information within due time, a large percentage of answers were received and the I.A.M.L.T. would like to extend thanks to all collaborators. The response to the investigations proved the importance of the problems and the interest taken in the profession of the MLT from different sides.

1. In *Europe* the profession is considered almost entirely a female one, except in Great Britain where male technologists are at present in a majority.

2. The *training systems* vary, but in most countries an advanced education standard is required and the basic professional training is an all-round instruction in all fields of laboratory technology. The candidates cannot present themselves for the examinations before the age of 20 or 21. Specialists are mostly formed in post-graduate studies.

3. The *standard of training* seems to be about the same in France, Germany, the Netherlands and Switzerland. However, in Germany the training differs in that instruction in radiography is still included. In Great Britain the instruction is more technical than in other countries. In the Scandinavian countries, with the exception of Denmark, nursing plays a predominant part, to the detriment of laboratory training.

4. In all countries, where the profession is established, *professional societies* exist, which make efforts to uphold standards, to improve training and working conditions, as well as to emphasise the need to employ qualified rather than unqualified staff. The members of these societies are almost exclusively qualified MLTs. In most countries very little help is granted by the governmental authorities.

5. In Germany where the profession was hitherto well controlled by the State, a new law permitting untrained people the exercise of the

profession under constant supervision of a medical man (except bacteriologists) has unfortunately marked a definite step backwards. This law is therefore strongly opposed.

6. Of all European countries England has the oldest and the most uniform organisation. The Institute of Medical Laboratory Technology undoubtedly represents a unity that possesses authority over all medical laboratory technologists of Great Britain and some Colonial territories. A similar organisation would be difficult in the other countries where the training system is conducted in professional schools.

7. The MLTs of all countries are interested in the possibilities of working abroad. *Exchanges* are already possible between some countries, but it would be highly desirable if *scholarships* were available for studies abroad, to provide additional experience without material difficulties.

8. The profession suffers from the fact that it is often unprotected by law. The studies are not uniform and therefore sometimes insufficient. The problems and difficulties encountered seem to be the same in most countries. Each country might benefit from a close international collaboration. Already the different member societies of the I.A.M.L.T. invite their neighbours to professional meetings and refresher courses. This provides the opportunity of exchanging ideas and is of undoubted value.

The *conclusions* which can be drawn from the investigations of the *Non-European countries* are the following:

1. Most of the countries being linked with Great Britain have adopted the British system of training and organising the profession, with variations due to local circumstances. The professional societies are in some cases only of recent origin and some are still under the patronage of an academic scientific society.

2. U.S.A. and Canada have, partly due to the vast area of their countries, and partly to the different educational system, a training that differs from the European systems but the final qualifications seem to be well comparable. Both countries are the only ones in which post-graduate studies can be followed up to the acquisition of academic degrees.

Japan seems to organise its professional society after the American model.

3. Exchange of labour is possible between North American and European MLTs but it is too early to consider exchanges with Africa or Asia, though a keen interest in international collaboration is evident.

4. Rarely is the profession officially recognised and protected by law.

ABSTRACTS

Abstractor: A. SCOTT

HISTOPATHOLOGY AND HISTOCHEMISTRY

Obtaining Flat Serial Sections for Electron Microscopy. A method is given for the mounting of serial sections on to a specimen grid without wrinkling. Westfall, J. A. (1961) *Stain. Tech.*, **36,** 36. — V.J.E.

Simultaneous staining of Reticulocytes and Heinz bodies with new Methylene Blue N in dogs given Iproniazid. The technique given stains reticulocytes and Heinz bodies in one step. No counterstaining of the blood smear is necessary. Thompson, E. C. (1961) *Stain. Tech.*, **36,** 38. — V.J.E.

Phosphotungstic acid-eosin combined with Haematoxylin as a stain for Negri bodies in paraffin sections. After staining with haematoxylin, sections are placed in a phosphotungstic acid-eosin mixture, washed, dehydrated, cleared and mounted. Negri bodies stain deep red, clearly showing internal structures. Massignani, A. M. & Malferrari, R. (1961) *Stain. Tech.*, **36,** 5. — V.J.E.

Enzymatic elimination of Collagen in the Alcian Blue staining of connective ground substance. Paraffin sections of freeze-dried tissues are treated with collagenase prior to staining with Alcian blue technique. The elimination of collagen staining is of value where small quantities of mucopolysaccharide are present. Ring, J. R., Krug, D. and Ogawa, A. D. (1961) *Stain. Tech.*, **36,** 53. — V.J.E.

Differential impregnation of degenerating nerve fibres in paraffin-embedded material. This is a modification of the original Nante-Gygaz method, performed on paraffin section mounted on slides. It is shown that the use of pyridine helps to suppress the impregnation of normal fibres but that better suppression can be obtained by the use of higher methylated derivatives of pyridine, usch as collidine and lutidine. Guillery, R. W., Shirra, B. and Webster, K. E. (1961) *Stain Tech.*, **36,** 9. — V.J.E.

The March method advantages of Dichromate fixation. It was found that best results on mouse CNS are obtained by using Muller's fluid for fixation and either the Swank-Davenport mixture or the Poirier-Ayotte-Gauthier modification for staining. It is believed that this method probably gives the best results for cat tissues also. Harman, P. J. (1961) *Stain Tech.*, **36,** 49. — V.J.E.

Differential staining of acidic tissue components by the improved Bi-col method. A modification of the original Bi-Col method is given with its application to tissue extracts on glass fibre filters. Wolman, M. (1961) *Stain Tech.*, **36,** 21. — V.J.E.

Staining of ultra-violet irradiated chromosomes by the Gomori alkaline phosphatase technique. Chromosome segments are selectively irradiated with an ultra-violet microbeam. Previous studies have shown

that in such segments most or all of the DNA is lost and that they appear pale with most staining methods. It is shown however, that these irradiated areas can be stained by the Gomori method for alkaline phosphatase. Positive results are also obtained after enzyme inactivation. It is concluded that staining by the Gomori method is independent of the presence of DNA and is due to no specific precipitation of calcium phosphate rather than to enzymatic activity. Amenta, P. S. (1961) *Stain. Tech.*, **36,** 15. — V.J.E.

Comparison of the cell-block, Papanicolaou and Milipore filter techniques for the cytologic examination of serous fluids. Three methods were used in examining serous fluids from 94 patients. (1) Preparing cell-block paraffin sections. (2) Staining smears made from centrifuged deposit by Papanicolaou method. (3) Filtering cells from fluid using Millipore filter (pore size 5u) then staining them on the filter, mounting and examining the filter direct. The first and third methods gave most reliable results; two methods used together gave results more reliable than one alone. The Millipore filter was particularly useful for small quantities of fluid Taft, P. D. and Arizagacouz, J. M. (1960) *Amer. J. Clin. Path.*, **34,** 561. — G.H.G.

Fluorescent histiocytes in sputum related to smoking. Direct examination of sputa under ultra-violet light showed that pulmonary histiocytes of smokers showed bright fluorescence. Histiocytes from non-smokers did not fluoresce. The substance causing fluorescence was shown to be localised in lipid granules (P.A.S. and Sudan black-staining positive) and was removed by hot chloroform. Vassar, P. S., Culling, C.E.A. and Saunders, A. M. (1960) *A.M.A. Arch. Path.*, **70,** 649. — G.H.G.

Desoxy, Ribonucleic Acid. A fluorescent histochemical technique. Desoxyribonucleic acid (D.N.A.) was shown to be specifically stained using a fluorescent Schiff-type reagent containing acriflavin. The reagent was applied to smears and sections following hydrolysis with hydrochloric acid as in the Feulgen method and followed by acid-alchool in place of the conventional sulphite rinse. Under ultra-violet light D.N.A. fluoresced bright golden-yellow. Culling, C. E. A. and Vassar, P. (1961) *A.M.A. Arch. Path.*, **71,** 76. — G.H.G.

Permanganate-alcian blue (P.B.A.) a valuable stain for connective tissue, keratin and fungi. Paraffin sections of skin fixed in either Bouin's Fluid or formol calcium were treated with 0.25 per cent potassium permanganate in 0.5 per cent sulphuric acid for 10 minutes, bleached in 2 per cent oxalic acid and stained either in (*a*) 0.1 per cent Alcian blue in 3 per cent acetic acid (pH 2.7) or (*b*) in 1 per cent Alcian blue in 10 per cent sulphuric acid (pH 0.2). A haemalum or kernechrot counterstain followed. Results are poor with Bouin's fluid, good with formol calcium. The most useful results are that mast cells, keratin and fungi stain vividly with Alcian blue-sulphuric acid. With the acetic acid solution weaker acid compounds and neutral polysaccharides such as glycogen stain. Prunieras, M. (1960) *J. Invest. Dermat.*, **35,** 309. — G.H.G.

Vestopal W. A superior embedding medium for electron microscope study of human epidermis. The use of a polyester copolymer Vestopal W is described. Tissues are fixed in buffered osmium tetroxide, dehydrated in acetone impregnated with graded Vestopal W/ acetone solutions and finally placed in Vestopal W plus initiator and activator. Sections cut from this material were superior to more commonly used butyl methacrylate giving excellent resolution and ease of focusing with the electron miscroscope. Zelickson, A. S. and Hartman, J. F. (1960) *J. Invest. Dermat.*, **35,** 315. — G.H.G.

A new cryostat for frozen section technique. This is a home-made apparatus consisting of a refrigeration unit on a movable trolley. The compressor is placed on the lower shelf; the refrigeration coil lies within the walls of an insulated box and contains a rotary microtome with the handle mounted on an elongated spindle to allow external operation. The lid is removed for use. Good sections may be rapidly done by this apparatus and it is fairly cheap to make. Chang, J. P., Russel, W. O., Moore, E. B., and Sinclair, W. V. (1961) *Amer. J. Clin. Path.*, **35,** 14. — G.H.G.

Use of Microtome cryostat for rapid frozen sections. The use of an American cryostat (the Harris Microtome Cryostat) is evaluated and it is considered to give quick frozen sections for diagnostic purposes of quality similar to the paraffin method. Nunnally, R. M. and Abbott, J. P. (1961) *Amer. J. Clin. Path.*, **35,** 20. — G.H.G.

Observations on the use of established diazotates for the demonstration of alkaline phosphatase, acid phosphatase and non-specific esterase in the adrenal and prostate gland by the Azo-Dye coupling method. The use of 24 commercially available diazotates in azo-coupling methods for acid and alkaline phosphatase and non-specific esterase was investigated. Alphanapthyl phosphate was used as substrate for the phosphatases and alphanapthyl acetate for esterase. Special consideration was given to adequate staining, positive staining in controls which should have been negative, nature of dye produced—whether amorphous or crystalline and the solubility of the produced dye in lipids. Among the various results reported the most useful diazotes for both tissues were Fast Blue R.R. and Fast Red L.T.R. for alkaline phosphatase, Fast Corinth V for acid phosphatase and Fast Corinth V and Fast Red L.T.R. for non-specific esterase. Pryse-Davies, J., Dawson, I. M. P. and Snape, I. M. (1961) *J. Path. Bact.*, **81,** 197. — G.H.G.

A stain for mast cells which is rapid and permanent. Frozen sections from fresh or 10 per cent formalin fixed material are cut and with a glass rod floated on and off the surface of tap water, then on the surface of 10 per cent formalin. They are then rolled on and off the surface of Terry's polychrome methylene blue several times until the required degree of staining is produced. They are then floated on tap water, mounted on a slide and blotted, dehydrated and differentiated in 95

per cent of absolute alcohol, cleared in xylol and mounted. Mast cell granules are fairly well stained blue. Stinson, J. C., Sunbury, T. R. and Waller, A. L. (1961) *J. Invest. Dermat.*, **361,** 1. — G.H.G.

A method for the demonstration of minute amounts of Melanin Pigment. Sections from paraffin embedded material are stained by Delafield's haematoxylin and eosin, dehydrated in cellosolve and cleared in xylol, then allowed to dry for 20 minutes or longer. A drop of mountant is added, a coverslip placed in position and the slide examined immediately. Fine melanin granules in stratified squamous epithelium, melanophores, etc., are seen easily but disappear in 5-15 minutes. The author considers that small amounts of melanin are rendered invisible by absorption of clearing agents. Young, J. K. (1961) *Amer. J. Clin. Path.*, **35,** 264.— G.H.G.

Fluorescence miscroscopy in exfoliative cytology. Smears from gynaecological materials were stained by a simple acridine orange solution (1 in 10,000 acridine orange in buffer at pH 4), differentiated in 0.1 M calcium chloride and mounted in a drop of buffer before examining under ultra-violet light. Duplicate smears were stained by the Papanicolaou method. It was concluded that the fluorescent method was neither more rapid nor easier for screening, colour and brilliance of fluorescence was in no way specific for atypical or malignant cells, and that morphological detail was poorly presented. Liu, W. (1961) *A.M.A. Arch. Path.*, **71,** 286 — G.H.G.

A simple method of identifying ganglion cells in sympathectomy specimens. This was developed for rapid work while patients are in the operating theatre. The supposed ganglion is laid out on aboard, cut in two with a sharp razor and one half squashed between two slides. One slide with the tissue on it is allowed to dry and a drop of 0.5 per cent alcoholic toluidine blue added for 8 seconds, washed off in distilled water and a drop of water used to mount under a coverslip. Large blue ganglion cells are easily identified if they are present. Kopel, M. (1961) *Amer. J. Clin. Path.*, **35,** 295. — G.H.G.

Detection by fluorescence of oxytetracycline bound in bone. Antibiotics of the tetracycline series are bound in growing bone and are detectable by their auto-fluorescence. Sections are prepared using a methacrylate embedding method, ground (on emery paper) and examined by fluorescent microscopy . The value of he method lies in the ability to determine exact age of bone tissue, as each drug treatment gives rise to a fluorescent band. The rate of bone building and destruction can be followed. Nuzu, E. (1961) *Nature*, **189,** 935. — G.H.G.

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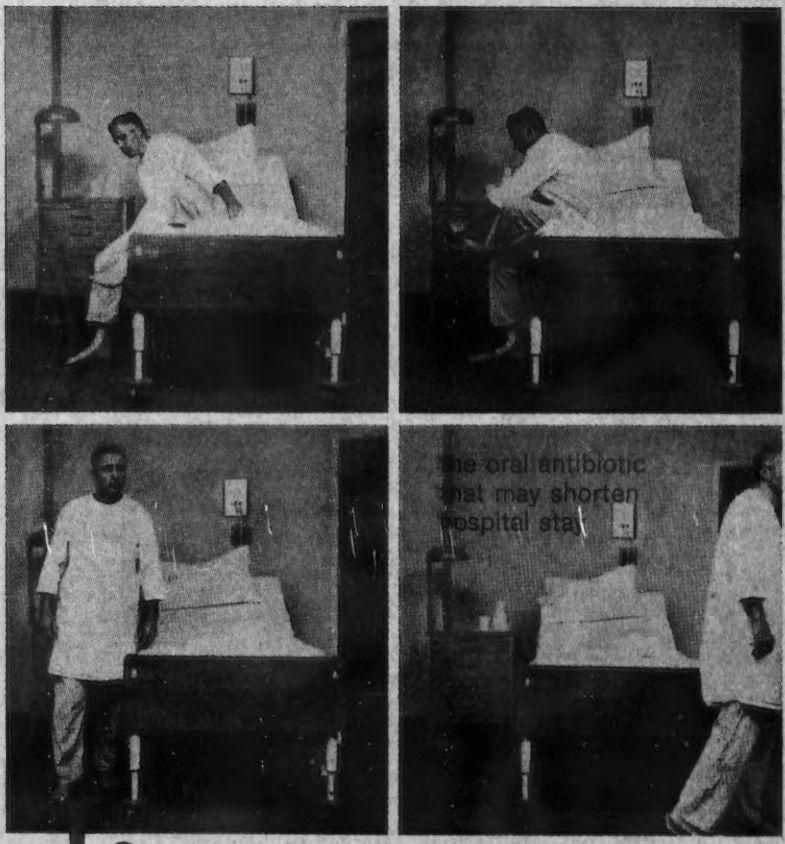

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